

IPENZ ENGINEERING UPDATE August 2008



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► Special Focus on Electric Vehicles



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Management/Leadership/Strategic Planning/Recruitment/Training and Development/Project Management/Corporate Responsibility

√IPENZ 17/01 The competitive imperative of learning.

Edmondson, A. Harvard Business Review, Volume 86 Issue 7/8 (July/August 2008) Pages 60-67.

Most executives believe that relentless execution – efficient, timely, consistent production and delivery of goods or services – is the surefire path to customer satisfaction and positive financial results. But this is a myth in the knowledge economy, argues Edmondson, a Harvard Business School professor. She points to General Motors, which for years has remained wedded to a well-developed competency in centralized controls and efficient execution but has steadily lost ground, posting a record \$38.7 billion loss in 2007. Such an execution-as-efficiency model results in employees who are exceedingly reluctant to offer ideas or voice questions and concerns. Placing value only on getting things right the first time, organizations are unable to take the risks necessary to improve and evolve. By contrast, firms that put a premium on what Edmondson calls execution-as-learning focus not so much on how a process should be carried out as on how it should evolve. Since 1980 General Electric, for instance, has continued to reinvent itself in every field from wind energy to medical diagnostics; and it enjoyed a \$22.5 billion profit in 2007. Organizations that foster execution-as-learning provide employees with psychological safety. No one is penalized for asking for help or making a mistake. These companies employ four distinct approaches to day-to-day work.

√IPENZ 17/02 Meeting the power industry's workforce challenges.

Hansen, T. Power Engineering, Volume 112, Issue 6, (June 2008) Pages 40,42,44.

The 2007 Survey of Reliability Issues has found the biggest challenge to reliability of power supply is the aging workforce and the lack of skilled workers. The survey was conducted by the National Electric Reliability Corporation. The industry is aware of the challenges and has formed a non-profit consortium called Center for Energy Workforce Development (CEWD) with the aim of helping utilities work together to develop solutions.

√IPENZ 17/03 A strategic safety management framework through balanced scorecard and quality function deployment.

Gundu, M and Simsek, B. Canadian Journal of Civil Engineering, Volume 34, Issue 4 (May 2007) Pages 622-630.

Outlines a proposal for a safety framework for the construction industry. Includes a literature survey to identify key issues to consider for safety performance.

√IPENZ 17/04 Stop wasting valuable time.

Mankins, M. Harvard Business Review, Volume 82 Issue (September 2004) Pages 58-65.

Companies routinely squander their most precious resource—the time of their top executives. In the typical company, senior executives meet to discuss strategy for only three hours a month. And that time is poorly spent in diffuse discussions never even meant to result in any decision. The price of misused executive time is high. Delayed strategic decisions lead to overlooked waste and high costs, harmful cost reductions, missed new product and business development opportunities, and poor long-term investments. But a few deceptively simple changes in the way top management teams set agendas and structure team meetings can make an enormous difference in their effectiveness. Efficient companies use seven techniques to make the most of the time their top executives spend together.

√IPENZ 17/05 **Social intelligence and the biology of leadership.**

Goleman, D and Boyatzis, R. Harvard Business Review, Volume 86 Issue 9 (September 2008) Pages 74-81.

A decade ago in these pages, Goleman published his highly influential article on emotional intelligence and leadership. The authors extend Goleman's original concept using emerging research about what happens in the brain when people interact. Social intelligence, they say, is a set of interpersonal competencies, built on specific neural circuits, that inspire people to be effective. They describe how the brain's mirror neurons enable a person to reproduce the emotions she detects in others and, thereby, have an instant sense of shared experience. Organizational studies document this phenomenon in contexts ranging from face-to-face performance reviews to the daily personal interactions that help a leader retain prized talent. Other social neurons include spindle cells, which allow leaders to quickly choose the best way to respond to someone, and oscillators, which synchronize people's physical movements. Great leaders, the authors believe, are those whose behaviors powerfully leverage this complex system of brain interconnectedness. In a handy chart, the authors share their approach to assessing seven competencies that distinguish socially intelligent from socially unintelligent leaders.

√IPENZ 17/06 **"Do you have a minute?" Seven strategies for limiting office Interruptions.**

Criswell, C. Journal for Quality & Participation, Volume 31 Issue 1 (Spring 2008) Pages 29-30.

√IPENZ 17/07 **How Should Team Meetings Flow?**

Lee, S. Journal for Quality & Participation, Volume 31 Issue 1 (Spring 2008) Pages 25-28.

√IPENZ 17/08 **Philip Louis Pratley (1884-1958): bridge design engineer.**

Passfield, R. Canadian Journal of Civil Engineering, Volume 34, Issue 5 (May 2007) Pages 637-650. Biography of the Canadian bridge engineer.

√IPENZ 17/09 **Investing in the IT that makes a competitive difference.**

McAfee, A and Brynjolfsson, E. Harvard Business Review, Volume 86 Issue 7/8 (July/August 2008) Pages 98-107.

Investments in certain technologies do confer a competitive edge—one that has to be constantly renewed, as rivals don't merely match your moves but use technology to develop more potent ones and leapfrog over you. That's the conclusion of a comprehensive analysis that Harvard Business School professor McAfee and MIT professor Brynjolfsson conducted of all publicly traded U.S. companies in all industries over the past few decades. They found a clear correlation between levels of IT spending and a new competitive dynamic.

√IPENZ 17/10 **Planning in the dark: Why major engineering projects fail to achieve key goals.**

Lawrence, P and Scanlan, J. Technology Analysis & Strategic Management, Volume 19 Issue 4 (July 2007) Pages 509-525.

Focus is on the aerospace and defence industries but the issues are generic across all areas of engineering. This study reviews project management failures over ten years.

√IPENZ 17/11 **Project leadership in multi-project settings: Findings from a critical incident study.**
Kaulio, M. International Journal of Project Management, Volume 26, Issue 4 (May 2008,) Pages 338-347.

This paper identifies and analyzes critical incidents that project leaders - working in multi-project settings - encounter in their daily work. The empirical base for the paper is data on 48 critical incidents collected using a version of the critical incident technique. Results show that the most frequent issues with which project leaders deal are: technical difficulties, dyadic leadership and group dynamics, followed by consultant, client, and peer relations. Moreover, on the basis of a categorisation of project leader roles, in terms of management/leadership and external/internal roles, a framework that is referred to as the Overall-Project-Leader-Role framework, has been developed and related to the empirical findings.

√IPENZ 17/12 **Successful management methodologies for achieving co-worker health in a large organization.**

Wreder, A. Total Quality Management & Business Excellence, Volume 18 Issue 7 (September 2007) Pages 823-844.

Describes how one organisation has been successful in reducing sick leave, improving worker health and increasing profitability.

√IPENZ 17/13 **The mismatched worker: When people don't fit their jobs.**

Kalleberg, A. Academy of Management Perspectives, Volume 22 Issue 1 (February 2008) Pages 24-40.

An examination of changes in the U.S. labour market have identified seven types of mismatches between workers and their roles. The implications are discussed.

√IPENZ 17/14 **Conflict resolution in virtual teams.**

Yuhung Shin. Organizational Dynamics, Volume 34 Issue 4 (2005,) Pages 331-345.

√IPENZ 17/15 **The stairway to the top: The remuneration of academic executives.**

Clements, K and Izan, H. Australian Journal of Management, Volume 33 Issue 1 (June 2008) Pages 1-30.

Review of the remuneration structure at Australian universities which factors in a managerial element. Similar to CEOs in the private sector, the size of the institution also has an impact on pay compensation.

√IPENZ 17/16 **Tough talk about crisis management: General Russel Honoré, who headed the U.S. military's response to Hurricane Katrina, offers blunt advice on surviving organizational disaster.**

Robison, J. Gallup Management Journal Online (14 August 2008) Pages 1-7.

General Russel Honoré, former commander of the U.S. Joint Task Force-Katrina, is interviewed on leadership.

√IPENZ 17/17 **Understanding and developing strategic corporate social responsibility.**

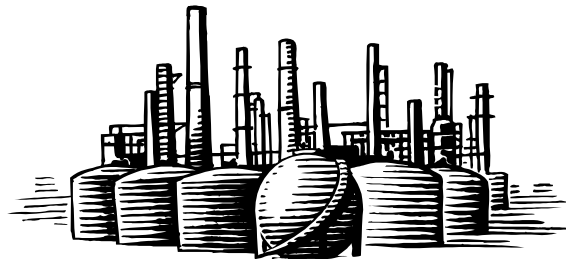
Heslin, P and Ochoa, J. Organizational Dynamics, Volume 37, Issue 2, (April-June 2008) Pages 125-144.

√IPENZ 17/18 **Managing public-private megaprojects: Paradoxes, complexity, and project design.**
van Marrewijk, A et al. International Journal of Project Management, Volume 26, Issue 6, (August 2008) Pages 591-600.

Recent studies show that despite their growing popularity, megaprojects - large-scale, complex projects delivered through various partnerships between public and private organisations - often fail to meet costs estimations, time schedules and project outcomes and are motivated by vested interests which operate against the public interest. This paper presents a more benign and theoretically-grounded view on what goes wrong by comparing the project designs, daily practices, project cultures and management approaches of two recent megaprojects in The Netherlands and Australia, showing how these projects made sense of uncertainty, ambiguity and risk. We conclude that project design and project cultures play a role in determining how managers and partners cooperate to achieve project objectives to a greater or lesser extent.

√IPENZ 17/19 **No. 1 way to avoid catastrophic failure.**

Gutzwiller, L. Pollution Engineering, Volume 40, Issue 7 (July 2008) Pages 28-30,33-37.
Despite careful monitoring and maintenance, sudden and catastrophic failures can still happen. Safety of fan installations is discussed.



√IPENZ 17/20 **Benchmark globally, improve plant performance locally.**

Stallard, S and Curley, M. Power Engineering, Volume 112, Issue 7 (July 2008) Pages 78,80,82.
Describes the World Energy Council Performance of Generating Plant initiative to collect plant performance statistics from a number of countries and use them to benchmark performance.

√IPENZ 17/21 **Introducing ISO 14001 III.**

Pojasek, R. Environmental Quality Management, Volume 17 Issue 1 (Fall 2007) Pages 75-82.
Integrating the ISO 14001 program with other management practices.

√IPENZ 17/22 **Niche entry as a route to mainstream innovation: Learning from the phosphoric acid fuel cell in stationary power.**

Hendry, C., Harborne, P and Brown, J. Technology Analysis & Strategic Management, Volume 19 Issue 4 (July 2007) Pages 403-425.
Some interesting observations about trying to establish new technologies in the market place, using the phosphoric acid fuel cell as a case study.

Technical Aspects of Engineering



√IPENZ 17/23 **Economic loss assessment due to railroad and highway disruptions.**
Tsuchiya, S., Tatano, H and Okada, N. Economic Systems Research, Volume 19 Issue 2 (June 2007) Pages 147-162.

√IPENZ 17/24 **Hurricane preparedness.**
Petruska, D et al. Offshore, Volume 68 Issue 8 (August 2008) Pages 123-128.

√IPENZ 17/25 **Punching shear strength of reinforced concrete slabs without transverse reinforcement.**
Muttoni, A.. ACI Structural Journal, Volume 105 Issue 4 (July/August 2008) Pages 440 - (16 pages)

√IPENZ 17/26 **Solar reflectance values for concrete.**
Marceau, M and VanGeem, M. Concrete International (August 2008) Pages 52-58.

√ IPENZ 17/27 **Recycling waste latex paint in concrete with added value.**
Mohammed, A., Nehdi, M and Adaw, A. ACI Materials Journal, Volume 105, Issue 4 (July/August 2008) Pages 367-374.

IPENZ 17/28 **Seismic behavior and capacity/demand analyses of three multi-span simply supported bridges.**
Saadeghvaziri, M and Yazdani-Motlagh, A. Engineering Structures, Volume 30, Issue 1 (January 2008) Pages 54-66.

√ IPENZ 17/29 **Concrete cracking in tension members and application to deck slabs of bridges.**
Muttoni, A. Fernández Ruiz, M. Journal of Bridge Engineering, Volume 12 Issue 5, (September 2007) Pages 646-653.

√ IPENZ 17/30 **New technology determines exact spatial location of water and sewer pipes.**
Ward, L. American Water Works Association. Journal, Volume 100 Issue 7 (June 2008) Pages 46-48, 50, 52.

√ IPENZ 17/31 **Prediction of water pipe asset life using neural networks.**
Achim, D., Ghotb, F and McManus, K. Journal of Infrastructure Systems, Volume 13 Issue 1 (March 2007) Pages 26-30.

√ IPENZ 17/32 **Factors contributing to the failure of asbestos cement water mains.**

Yu, H and Hubble, D. Canadian Journal of Civil Engineering, Volume 34 Issue 5 (May 2007) Pages 608-621.

√ IPENZ 17/33 **Wireless for controls: an update.**

Roth, K., Quartarao, L and Brodrick, J. ASHRAE Journal, Volume 50 Issue 8 (August 2008) Pages 76-78.

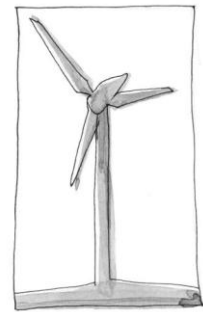
Wireless used for building control systems.

√ IPENZ 17/34 **Electrochromic glazing and facade photovoltaic panels: a strategic assessment of the potential energy benefits.**

Mardaljevic, J and A Nabil, A. Lighting Research and Technology, Volume 40 Issue 1 (March 2008) Pages 55-76.

√ IPENZ 17/35 **Intermittent wind: problems and a possible solution.**

Blankinship, S. Power Engineering, Volume 112, Issue 6, (June 2008) Pages 52,54,56,58,60.



√ IPENZ 17/36 **Ultraviolet germicidal irradiation: current best practices..**

Martin, S et al. ASHRAE Journal, Volume 50 Issue 8 (August 2008) Pages 28-30,32,34-36.

√ IPENZ 17/37 **Dynamic adaptation policies to improve quality of service of real-time multimedia applications in IEEE 802.11e WLAN Networks.**

Ramos, N., Panigrahi, D and Dey, S. Wireless Networks, Volume 13, Issue 4, (August 2007) Pages 511-535.

√ IPENZ 17/38 **Corrosion behaviours of several thermal spray coatings used on boiler tubes at elevated temperatures.**

Rezakhani, D. Anti-Corrosion Methods and Materials, Volume 54 Issue 4 (2007) Pages 237-243.

√ IPENZ 17/39 **Hazardous waste management system in India : an overview.**

Kumar, S et al. Critical Reviews in Environmental Science and Technology, Volume 38 Issue 1 (2008) Pages 43-71.

IPENZ 17/40 **Reductive hydrothermal treatment of sewage sludge.**

Catallo,W and. Comeaux, J. Waste Management, Volume 28, Issue 11,(November 2008) Pages 2213-2219.

IPENZ 17/41 GIS-based approach for optimized siting of municipal solid waste landfill.
Sumathi, V., Natesan, U and Sarkar, C. Waste Management, Volume 28, Issue 11 (November 2008)
Pages 2146-2160.

√ **IPENZ 17/42 The Evolution of carbon capture technology (Part 2).**
Blankinship, S. Power Engineering, Volume 112 Issue 5 (May 2008) Pages 62,64,66-67.

√ **IPENZ 17/43 Assessing the sensibility of signal timing split optimization in addressing congestion.**
Clark, J. Institute of Transportation Engineers. ITE Journal, Volume 78 Issue 8 (August 2008)
Pages 24-29.

√ **IPENZ 17/44 Locating changeable message signs for advanced traffic information and management systems.**
Fu, F., Henderson, J and Li, S. Canadian Journal of Civil Engineering, Volume 34 Issue 5 (May 2007)
Pages 651-663.

√ **IPENZ 17/45 Predicting discomfort glare from outdoor lighting installations.**
Bullough, J et al. Lighting Research and Technology, Volume 40, Issue 3 (September 2003) Pages
225-238.

√ **IPENZ 17/46 Vibration isolation.**
Simmons, Robert. ASHRAE Journal, Volume 49 Issue 8 (August 2007) Pages 30-40.

√ **IPENZ 17/47 Data is key to flood control.**
Werblow, S. Pollution Engineering, Volume 40, Issue 8, (August 2008) Pages. 37-41.

√ **IPENZ 17/48 Comparison of the CEST and SLOSH models for storm surge flooding .**
Zhang, K., Xiao C and Shen, J. Journal of Coastal Research, Volume 24 Issue 2 (March 2008) Pages
489-499.

√ **IPENZ 17/49 A new optimization model for distribution substation siting, sizing, and timing.**
El-Fouly, T et al. International Journal of Electrical Power & Energy Systems, Volume 30, Issue 5,
(June 2008) Pages 308-315.

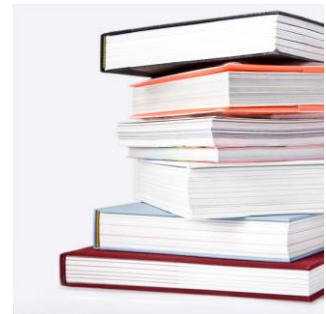
√ **IPENZ 17/50 Integrating renewables into the U.S. Grid: is it sustainable?**
Jansson, P and Michelfelder, R. The Electricity Journal, Volume 21, Issue 6 (July 2008) Pages 9-21.

√ IPENZ 17/51 **Trigeneration: A new way for landfill gas utilization and its feasibility in Hong Kong.** Hao, X., Yang, H and Zhang, G. Energy Policy, Volume 36, Issue 10 (October 2008) Pages 3662-3673.

√ IPENZ 17/52 **Performance of commercially available solar and heat pump water heater.** Lloyd, C and Kerr, A. Energy Policy, Volume 36, Issue 10 (October 2008) Pages 3807-3813.

Books held in Energy Library

These can be borrowed directly by Energy Library members or via interlibrary loan by non-members.



√ IPENZ 17/53 **Challenging the future: connecting the words in risk communication.** (2007) Tully, Jim Ed. Christchurch: New Zealand Centre for Advanced Engineering

In any risk situation, communication is the key to management of the resulting perception of the situation. Management must take great care in the way a situation is explained and managed, both internally and externally. Here, professionals discuss their experience of risk communication. Case studies are used to illustrate its implementation in a variety of situations.

√ IPENZ 17/54 **Strategic and competitive analysis: Methods and techniques for analysing business competition.** (2003) Fleisher, C.S.; Bensoussan, B. E. Upper Saddle River, N.J: Prentice Hall

√ IPENZ 17/55 **Solar revolution: the economic transformation of the global energy industry.** (2006) Travis Bradford. Cambridge, USA: MIT

This comprehensive book sets out to show that solar energy is the answer to most of the world's energy problems. The author explores the limitations of alternative energy options and details the promising future for solar energy.

√ IPENZ 17/56 **Fundamentals of carbon capture and storage technology.** (2007) London: Petroleum Economist

A very useful new publication on carbon capture and storage. A number of writers cover topics from the potential of carbon storage to the policy environment in Europe, the US and China.

√ IPENZ 17/57 **AS HB 167: 2006. Security risk management.**

√ IPENZ 17/58 **Distributed small-scale wind in New Zealand: Advantages, barriers and policy support instruments.** (2007) Martin Barry. Wellington: Victoria University of Wellington

This thesis looks at why New Zealand's wind energy industry is growing at a slower rate than the OECD average, in spite of there being many preconditions in its favour, such as having one of the best wind resources in the world.

√ IPENZ 17/59 **Hard facts, dangerous half-truths, and total nonsense: Profiting from evidence-based management.** (2006) Jeffrey Pfeffer. Boston: Harvard Business School Press

Organizations frequently do not look closely enough at their management practices, and instead of making worthwhile change, often merely repeat the mistakes of other firms and organizations. This book aims to help management scrutinize what they do, and review intended change, so that real and worthwhile progress is made.

√ IPENZ 17/60 **Harvard business review on change.**

(2006) Harvard Business School Press.

Articles include: Leading Change: Why Transformation Efforts Fail by John P. Kotter; Building Your Company's Vision by James C. Collins and Jerry I. Porras; Managing Change: The Art of Balancing by Jeanie Daniel Duck; The Reinvention Roller Coaster: Risking the Present for a Powerful Future by Tracy Goss, Richard T. Pascale, and Anthony G. Athos; Changing the Mind of the Corporation by Roger Martin; Why Do Employees Resist Change? by Paul Strelbel; Reshaping an Industry: Lockheed Martin's Survival Story by Norman R. Augustine; and Successful Change Programs Begin with Results by Robert H. Schaffer and Harvey A. Thomson.

Feature Focus: Electric Vehicles

Check out [details](#) of the Pickering Lecture being held countrywide and organised by IPENZ: "Plug in New Zealand Switch to Electric Cars"



√ IPENZ 17/61 **Integration of renewable energy into the transport and electricity sector through V2G.**

Lund, H and Kempton, W. Energy Policy, Volume 36 Issue 9 (September 2008) Pages 3578-3587. Large-scale sustainable energy systems will be necessary for substantial reduction of CO₂. However, large-scale implementation faces two major problems: (1) we must replace oil in the transportation sector, and (2) since today's inexpensive and abundant renewable energy resources have fluctuating output, to increase the fraction of electricity from them, we must learn to maintain a balance between demand and supply. Plug-in electric vehicles (EVs) could reduce or eliminate oil for the light vehicle fleet. Adding "vehicle-to-grid" (V2G) technology to EVs can provide storage, matching the time of generation to time of load. Two national energy systems are modelled, one for Denmark, including combined heat and power (CHP) and the other a similarly sized country without CHP (the latter being more typical of other industrialized countries)

√ IPENZ 17/62 A spark in the tank?

Cran-McGreehin, A. Environmental Finance, Volume 9 Issue 9 (July/August 2008) Pages 32-33.
High oil prices and climate change concerns are turning up the voltage on the electric car industry. The author reports on where investors see the most promising opportunities

√ IPENZ 17/63 Shortening the path to energy independence: A policy agenda to commercialize battery-electric vehicles.

Fontaine, P. The Electricity Journal, Volume 21, Issue 6 (July 2008) pages 22-42.

A key to accelerating the adoption of battery electric vehicles is to reduce their incremental cost by monetizing their lifetime CO2 reduction benefits, spreading the risk of technology failure efficiently, and treating them equally with other alternative fuels in the existing fuel diversification federal policy framework. Six policy changes may help.

√ IPENZ 17/64 Technologies for electric, hybrid and hydrogen vehicles: Electricity from renewable energy sources in transport.

Jorgensen, K. Utilities Policy, Volume 16 Issue 2 (June 2008) Pages 72-79.

The article analyses and compares electricity and hydrogen as transportation fuels. The analysis includes aspects such as the energy utilisation from grid to wheels, vehicle range (linked to the physical properties of the onboard storage), costs, and durability (particularly of batteries). The article concludes that it is not possible to identify one option as the best choice given the wide range of aspects to consider and the substantial uncertainties. There is no clear cut priority between the main options - electric, hybrid or hydrogen/fuel cell drive - or within these. On the other hand, the analysis also identifies options that are clearly not advantageous in terms of energy efficiency, e.g. hydrogen in internal combustion engines or liquid hydrogen.

√ IPENZ 17/65 Regenerative braking strategy for hybrid electric vehicles based on regenerative torque optimization control.

Wan, G and Zhuo, B. Proceedings of the Institution of Mechanical Engineers : Part D Journal of Automobile Engineering, Volume 222, Issue D4 (April 2008) Pages 499-513.

√ IPENZ 17/66 Optimal control of fuel economy in parallel hybrid electric vehicles.

Pu, J and Yin, C. Proceedings of the Institution of Mechanical Engineers.: Part D Journal of Automobile Engineering, Volume 221 Issue D4 (September 2007) Pages 1097-1106.

√ IPENZ 17/67 Plug-in hybrids: the cars that will recharge America.

Sherry, N. Gabriola Island, BC: New Society Publishers, 2006

A thought provoking book which traces the history and development of the plug-in hybrid car in America. The author argues the case for plug-in hybrids as a cost saving solution towards declining oil supplies and towards emitting less carbon emissions.



√ IPENZ 17/68 **Grid-connected vehicles as the core of future land-based transport systems.**

Gilbert, R and Perl, A. Energy Policy, Volume 35 Issue 5 (May 2007) Pages 3053-3060.

Grid-connected vehicles (GCVs)—e.g., electric trains, metros, trams, and trolley buses—are propelled by electric motors directly connected to remote power sources. Their low at-vehicle energy consumption and ability to use a wide range of renewable energy sources make them strong contenders for urban and interurban transport systems in an era of energy constraints that favours use of renewable fuels, which may lie ahead. Needs for autonomous motorised mobility could be acceptably met in large measure by deployment of personal GCVs, also known as personal rapid transit (PRT). Alternatives, including fuel-cell vehicles and dual-drive vehicles fuelled with ethanol, will be less feasible. The 'car of the future' may not be an automobile so much as a PRT element of a comprehensive GCV-based system that offers at least as much utility and convenience as today's transport systems.

√ IPENZ 17/69 **Optimal torque control strategy for parallel hybrid electric vehicle with automatic mechanical transmission.**

Chinese Journal of Mechanical Engineering (English edition). Volume 20, Issue 1 (February 2007) Pages 16-20.

√ IPENZ 17/70 **The car and fuel of the future.**

Romm, J. Energy Policy, Volume 34 Issue 17 (November 2006) Pages 2609-2614.

This paper is based on a review of the technical literature on alternative fuel vehicles (AFVs) and discussions with experts in vehicle technology and energy analysis. It is derived from analysis provided to the bipartisan National Commission on Energy Policy.

The most promising AFV pathway is a hybrid that can be connected to the electric grid. These so-called plug-in hybrids or e-hybrids will likely travel three to four times as far on a kilowatt-hour of renewable electricity as fuel cell vehicles. Ideally these advanced hybrids would also be a flexible fuel vehicle capable of running on a blend of biofuels and gasoline. Such a car could travel 500 miles on 1 gal of gasoline (and 5 gal of cellulosic ethanol) and have under one-tenth the greenhouse gas emissions of current hybrids

√ IPENZ 17/71 **Government policy and the development of electric vehicles in Japan.**

Ahman, M. Energy Policy, Volume 34 Issue 4 (March 2006) Pages 433-443.

The aim of this paper is to analyse the role that the Japanese Government has played in the development of alternatives to conventional vehicles, the effect of government programmes, and the importance of technical flexibility in government support schemes. The focus is on battery-powered electric vehicles (BPEVs), hybrid electric vehicles (HEVs), and fuel cell electric vehicles.

